

LOG 2525



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 28, 1994

In reply refer to: A-94-208
through -210

Honorable David R. Hinson
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On July 2, 1994, about 1843 eastern daylight time, a Douglas DC-9-31, N954VJ, operated by USAir, Inc., as flight 1016, crashed while executing a missed approach following an instrument landing system approach to runway 18R at Charlotte/Douglas International Airport, Charlotte, North Carolina. The captain and one flight attendant received minor injuries; the first officer, two flight attendants, and 18 passengers sustained serious injuries; and 37 passengers received fatal injuries. The airplane was destroyed by impact forces and a postcrash fire. Instrument meteorological conditions prevailed, and an instrument flight rules flight plan had been filed. Flight 1016 was being conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 121 as a domestic, scheduled passenger service flight from Columbia, South Carolina, to Charlotte.

The National Transportation Safety Board's investigation of this accident is ongoing. Although the airplane encountered severe windshear, the onboard windshear warning system failed to annunciate any warning to the flight crew. The reason for this failure has not been determined. However, the investigation has revealed evidence that the onboard windshear warning system would not have provided the flight crew of USAir flight 1016 with a timely warning. The Safety Board believes that the Federal Aviation Administration (FAA) should initiate action to correct this safety deficiency and to alert flight crewmembers of the current limitations of this system.

The crew stated that the flight was on final approach with the flaps extended to 40° when they entered a heavy rain shower and lost sight of the runway. The captain decided to discontinue the approach and called for the first officer, who was flying the airplane, to execute the missed approach procedure. In accordance with the approved procedure, the flap handle was raised to the 15° position. While the wing

flaps were retracting from 40° to 15°¹, the airplane encountered a severe windshear at an altitude of approximately 275 feet. The wind shifted from about 35 knots of headwind to about 25 knots of tailwind. The airplane struck the ground approximately 15 seconds after entering the windshear. A complete analysis of the final moments of the flight has not yet been completed.

USAir flight 1016 was equipped with a Honeywell, Inc., "Standard Windshear System." This system is a "reactive" system designed to provide windshear annunciations to the flight crew once the airplane encounters a dangerous windshear². A dangerous windshear is defined as one of such intensity and duration that it would likely cause ground contact without immediate corrective action. If such a windshear is detected, the system is designed to promptly activate red flashing "WINDSHEAR WARNING" lights and an aural "WINDSHEAR, WINDSHEAR, WINDSHEAR" warning. In response, flight crews are trained to immediately perform a windshear escape maneuver to obtain maximum performance from the airplane and minimize altitude loss during the windshear penetration.

A study performed by Honeywell using data from the accident airplane's flight data recorder indicates that the windshear warning system would not have activated until about 12 seconds after the airplane entered the windshear -- just 3 to 4 seconds before impact. The Safety Board learned that the warning system would have activated approximately 7 seconds earlier, but a design feature in the software delayed activation while the flaps were in transition. This design feature was incorporated by Honeywell to prevent nuisance warnings, but in this case it significantly delayed the windshear warning. The Safety Board believes that the delay rendered the system useless to the USAir flight 1016 flight crew because the warning would have occurred too late to allow the flight crew to perform a successful windshear escape maneuver.

Honeywell received Supplemental Type Certificate SA4817 from the FAA for installation of the Standard Windshear System in Douglas DC-9 airplanes on December 1, 1989. This STC was issued after FAA simulator testing during which the system was evaluated in many windshear profiles at all flap settings. During this testing, the system successfully activated within 5 seconds of encountering severe windshear. However, the system was not evaluated with the flaps in transition, and therefore, the evaluation did not reveal that the system could take 12 seconds to activate when a severe windshear was encountered while the flaps were in transition. In light of this

¹ According to data supplied by Douglas, it takes approximately 12 seconds for the flaps to retract from 40° to 15° on the DC-9-31.

² Title 14 CFR Part 121.358 requires that DC-9 operators equip their airplanes with either an approved "reactive" windshear warning system or an approved "predictive" windshear detection and avoidance system.

information, the Safety Board believes the FAA should review the certification of this system and require modifications to ensure prompt windshear warnings when the flaps are in transition. As an interim measure, flight crewmembers should be promptly advised of the current limitations of this system.

In July 1990, the FAA issued Technical Standard Order (TSO) C117, "Airborne Windshear Warning and Escape Guidance Systems for Transport Airplanes." This TSO prescribes the minimum performance standards for airborne windshear warning systems for transport-category airplanes. The TSO requires that a system successfully pass a series of simulated windshear tests by generating warnings within specified time intervals. The time intervals range from 10 seconds for a moderate windshear to 5 seconds for a severe windshear. The TSO requires that tests be conducted in a variety of flap configurations, but no testing is required with the flaps in transition. The Safety Board urges the FAA to modify the TSO to require testing of a windshear warning system with the flaps in transition before granting certification.

The National Aeronautics and Space Administration (NASA) Langley Research Center performed extensive flight testing of various developmental airborne windshear warning systems in 1991 and 1992. These tests were conducted using a specifically instrumented Boeing 737. No instances of nuisance windshear warnings were noted while the flaps were in transition. The NASA system and the other commercially available system do not delay warning activation while the flaps are in transition.

The Safety Board believes that the flight crews of airplanes equipped with the current Honeywell Standard Windshear System will not receive a prompt warning if severe windshear is encountered with the flaps in transition. Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Issue a Flight Standards Information Bulletin to operators of aircraft equipped with a Honeywell Standard Windshear System to assure that flight crewmembers of those airplanes are advised of the current limitation of the system that delays windshear warnings to flight crewmembers when the flaps are in transition. (Class I, Urgent Action)
(A-94-208)

Conduct a review of the certification of the Honeywell Standard Windshear System, with emphasis on performance while the flaps are in transition, and require that the system be modified to ensure prompt warning activation under those circumstances. (Class II, Priority Action)
(A-94-209)

Modify Technical Standard Order C-117 to ensure that windshear warning systems undergo testing with the flaps in transition before granting certification. (Class II, Priority Action) (A-94-210)

Chairman HALL and Members LAUBER and HAMMERSCHMIDT concurred in these recommendations.

By: 
Jim Hall
Chairman